



King County Greenhouse Gas Emissions Inventory

A 2015 Update: Executive Summary

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Introduction

To avoid the most serious impacts of climate change, deep reductions in greenhouse gases (GHG) emissions are needed. Quantifying sources of GHGs is a fundamental step toward reducing GHG emissions and tracking progress toward emission reduction targets. In 2014, the Growth Management Planning Council, the regional planning council which includes elected leaders from the 39 cities of King County and the Metropolitan King County Council, unanimously adopted ambitious shared near and long-term GHG reduction targets. King County further reaffirmed these targets with the adoption of its 2015 King County Strategic Climate Action Plan. The adopted targets are to reduce countywide sources of GHG emissions below 2007 levels 25% by 2020, 50% by 2030, and 80% by 2050. King County also committed to responsibility for periodic assessment and reporting of progress towards the targets.

This report provides a 2015 update of the county's communitywide emissions and compares results to newly updated inventories for 2003, 2008, and 2010. The report also quantified 2007 countywide emissions for use in comparison towards adopted targets.

As science and policy have progressed, relevant and accepted methodologies for producing a GHG inventory have changed. The *U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions* ("U.S. Community Protocol") has emerged as a consistent, U.S.-specific framework for quantifying GHG emissions at the community-scale. This 2015 inventory for King County follows the U.S. Community Protocol. To facilitate comparison among years, past data were also updated to reflect compliance with the U.S. Community Protocol.

This report includes two distinct inventories: a "geographic-plus" inventory and a "consumption-based" inventory. The geographic-plus inventory primarily estimates the annual GHG emissions released within community boundaries, but also includes emissions from electricity generated outside of King County but consumed within the County. This report also includes findings from a contribution analysis that identifies the drivers of change between the 2008 and 2015 geographic-plus inventories. The consumption-based inventory accounts for the GHG emissions associated with the consumption of goods and services within the community, regardless of where these goods were produced.

This report is focused on assessing total countywide emissions and documenting and explaining what caused recent trends in countywide emissions. To learn more about what King County is doing to confront climate change and reduce emissions, please refer to King County's 2015 Strategic Climate Action Plan available at www.kingcounty.gov/climate.



2015 Inventory Update - Summary of Key Findings

Geographic Plus Inventory Results

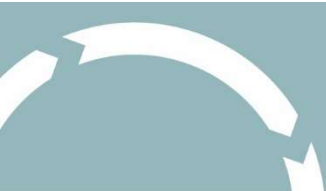
- King County's geographic-plus greenhouse gas (GHG) emissions (Figure ES-1) totaled 20.3 million metric tons of carbon dioxide equivalent (MgCO₂e) in 2015. The geographic-plus inventory quantifies all emissions that physically occur in King County, plus emissions associated with electricity used in King County regardless of where it was produced.
- The largest sources of geographic-plus based GHG emissions were the built environment (62%), dominated by GHG emissions from residential and commercial energy usage (Figure ES-2), and transportation (36%), dominated by GHG emissions from passenger vehicles.
- Total 2015 geographic plus emissions increased by an estimated 0.9% compared to total 2007 year emissions¹, despite a nearly 10% increase in population during this time period. However, this trend is not on track towards King County and Growth Management Planning Council (GMPC) adopted greenhouse gas (GHG) reduction targets that include a near term goal of a 25% reduction in countywide GHG emissions by 2020 compared to 2007.
- Per person GHG emissions declined to 9.9 MgCO₂e per person in 2015, an estimated 8% decrease compared to 2007. King County and GMPC targets include a per capita target of an 8.5 MgCO₂e per person by 2020.
- Core emissions, which include emissions from residential and commercial electricity and natural gas, on-road vehicles, and solid waste, peaked in 2010 and have declined by 1.3% (203,000 MgCO₂e) overall and 7% per capita (0.6 MgCO₂e per person).

Contribution Analysis of Geographic Plus Inventory

- As part of this inventory update, King County partnered with the City of Bellevue, ICLEI-Local Governments for Sustainability, and the Department of Energy to systematically assess, quantify, and explain observed changes in geographic-plus GHG emissions over time.
- The following factors had the biggest impacts (more than 0.5%²) on King County's geographic-plus emissions between 2008 and 2015 (see Figure ES-4):
 - **Population Growth** (+4.77%) includes the direct impacts of increased housing, increased number of people driving, and increased refrigerant leakage attributed to King County's

¹ King County's comprehensive GHG inventories are for 2003, 2008 and 2015 calendar years. The baseline year for adopted local GHG emissions reduction targets is 2007, and this report interpolates 2007 totals based on 2003 and 2008 inventory data. Results in this report are compared to both 2007 and 2008 years; 2010 data are also available for "core" GHG emissions sources and are presented.

² These percentage points represent the percent change in the total GHG emissions in King County attributed to this factor. In this first example, factors directly attributed to population growth resulted in an increase of countywide geographic plus based emissions of 4.77% between 2008 and 2015.



growing population. King County's population increased 8.6% from 1.89 million in 2008 to 2.05 million in 2015.

- **Increase in Fossil Fuel Sourced Electricity** (+3.10%) is the increase in emissions associated with the greater use of coal and natural gas in Puget Sound Energy's (PSE's) electricity production.
- **Increase in Commercial Building Floorspace** (+1.10%) is an increase that relates to growth in business activity in King County and increased use of energy for heating, cooling, lighting, and other building energy.
- **Increases in Transit, Marine, Rail, and Air Transportation** (+0.68%) is the total change in emissions from these forms of transportation.
- **Increased Demand for Electricity** (+0.61%) relates to increased electricity demand in the residential and commercial building sectors.
- **Decreased Car Use** (-0.53%) represents a change associated with less per-capita driving and less gasoline use by light vehicles.
- **Decreased Demand for Natural Gas** (-0.84%) represents less demand for natural gas in both the commercial and residential sectors. This is a change in demand *after* correcting for weather, changes in population, and changes business activity, so probably represents more gas-efficient equipment or buildings.
- **Industrial sector** (-1.56%) represents a change in gross industrial emissions, including changes in on-site fuel combustion, electricity consumption, and process emissions.
- **Improved Vehicle Fuel Efficiency** (-2.11%) is the reduction in emissions associated with reduced gasoline consumption in newer vehicles meeting more stringent federal fuel efficiency standards.
- **Increasing Renewable Energy** (-2.29%) relates to Washington State's renewable portfolio standard that requires utilities to gradually phase in increasing amounts of new, renewable energy sources such as wind and solar.
- **Warmer Weather** (-3.03%) relates to the fact that 2015 was a very warm year that resulted in less energy used for heating in winter.

Consumption Based Inventory Results

- King County's 2015 consumption-based GHG emissions totaled 58.2 million MgCO₂e (Figure ES-5): 2.7 times the emissions in King County's geographic-plus inventory. Consumption is defined as spending by consumers, governments, and business capital investments.
- Total inflation adjusted change in consumption (spending) between 2008 and 2015 was negligible, despite 8.6% population growth. However, total consumption-based GHG emissions increased by 5.8%. The primary cause for increased emissions between 2008 and 2015 was a shift to more foreign imports, which on average have higher emissions associated with production.
- Emissions associated with consumption come from the production, transport, sale, use and disposal of goods and services. In 2015, 71% of total consumption based emissions were attributed to the production and transport of goods or services, with the remainder associated with sale, use and disposal.

- 64% of King County's consumption based emissions occurred outside of King County; of this, 40% was emitted in foreign countries.
- In 2015, King County's largest sources of consumption-based greenhouse gas emissions were goods (25%), services (18%), homes and buildings (15%) and personal transportation (12%).
- Between 2008 and 2015, consumption based emissions from services grew 16% from 9.04 million tCO₂e to 10.5 million MgCO₂e; Homes & Buildings grew 19% from 7.14 million MgCO₂e to 8.51 million MgCO₂e; and Commercial Transportation grew 47% from 4.20 million MgCO₂e to 6.18 million tCO₂e.
- The growth in Commercial Transportation spanned most subcategories, though increased demand for truck services from households (i.e. goods delivery) and an increased use of light vehicles in the business sector were the biggest contributors. In 2015, per person emissions were 28.3 MTCO₂e (compared to 9.9 MTCO₂e per person in the geographic-plus inventory). Per-person inflation adjusted spending decreased by 7.8% relative to 2008, and consumption based emissions decreased slightly by 2.6% during this time, attributed to a combination of true reductions in individual spending (consumer restraint) with reductions in commodity prices on a real dollar basis (economic efficiency).

Figure ES-1. Sources of geographic-plus based GHG emissions for King County in 2015 (total = 20.3 million MgCO₂e). The geographic-plus inventory includes emissions that occur in King County, plus electricity related emissions no matter where they occur.

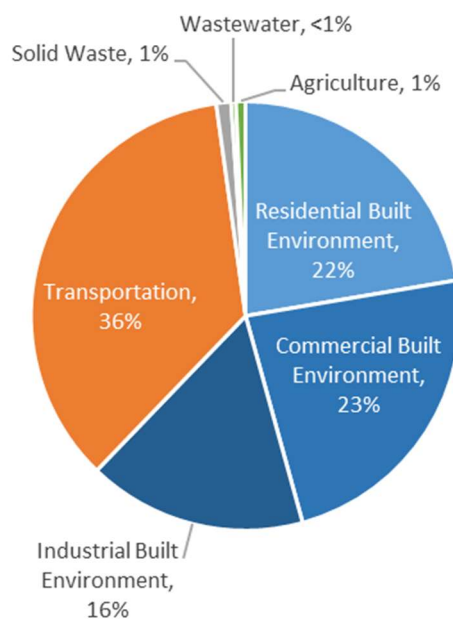


Figure ES-2. Sources of residential and commercial built environment GHG emissions for King County in 2015 (total = 9.3 million MgCO₂e).

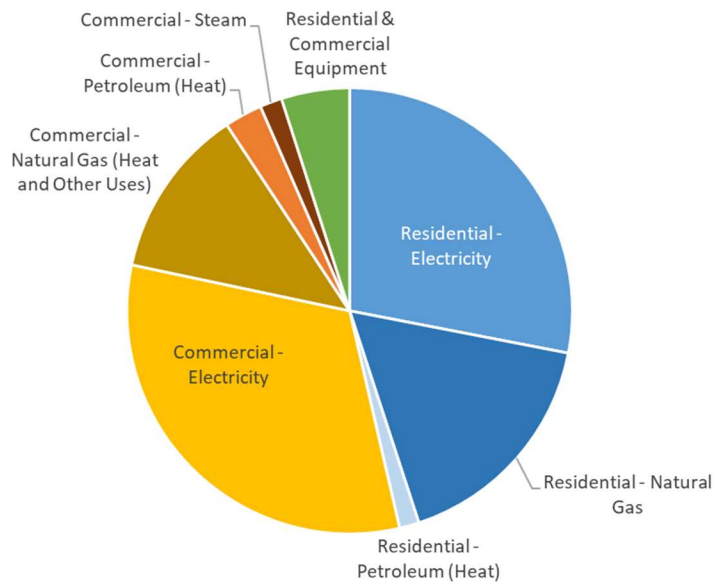


Figure ES-3. Geographic-plus based GHG emissions by sector for King County. This chart shows trends in total GHG emissions in King County since 2003. The following figure builds on this figure to document in a quantitative way what factors influenced trends in total emissions between 2008 and 2015.

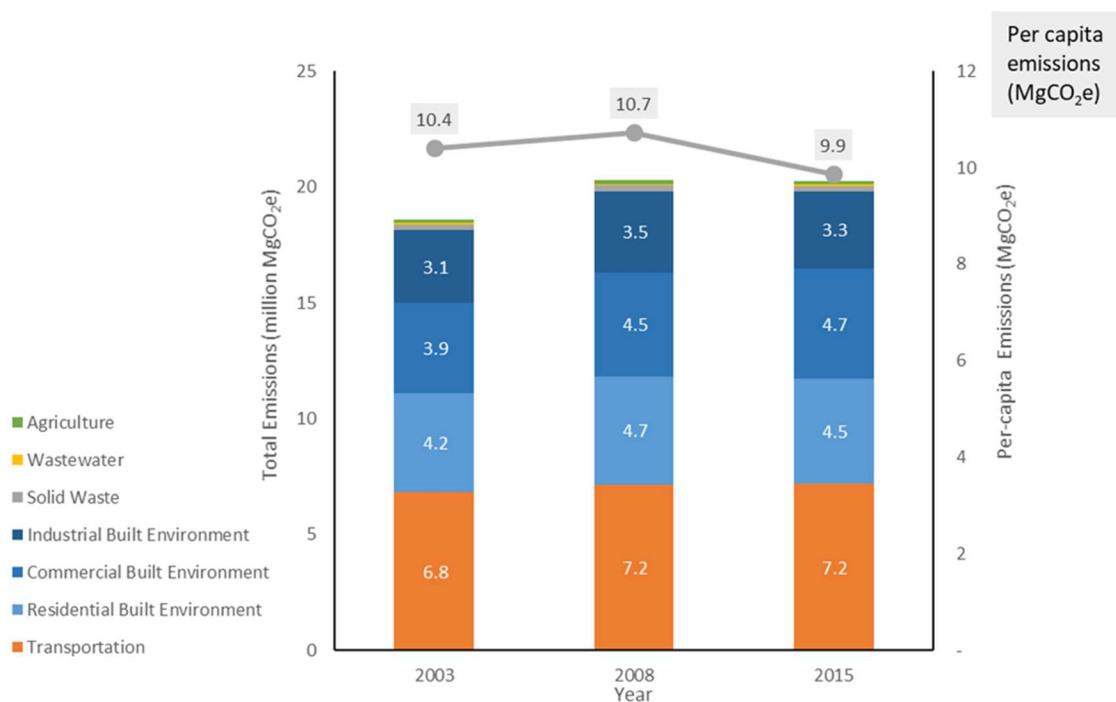


Figure ES-4. Contributions to change between the 2008 and 2015 Geographic-Plus GHG inventories. The vertical axis represents the 2008 GHG inventory's total; each red bar is an emissions increase in 2015 relative to 2008; each blue bar is an emissions decrease in 2015 relative to 2008.

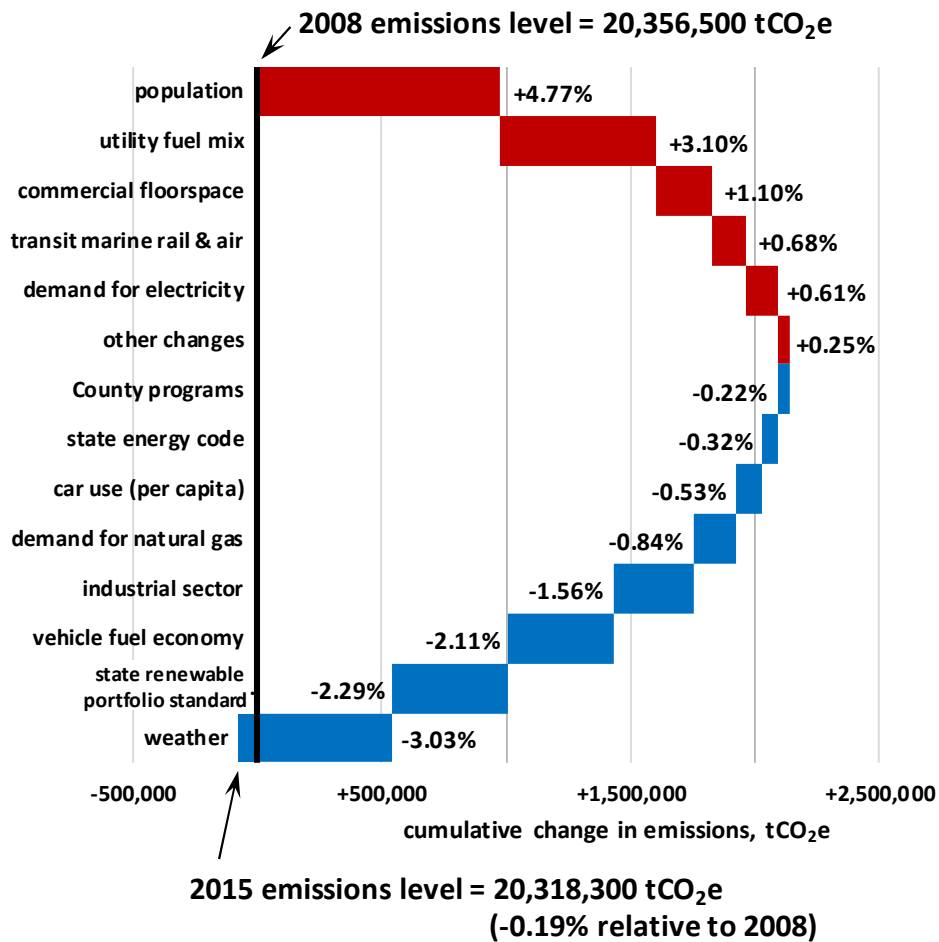


Figure ES-5. Consumption-based GHG emissions for King County in 2015 (total = 58.2 million MgCO₂e). The consumption based inventory estimated emissions associated with all King County resident, business and government spending and consumption, no matter where the emissions physically occurred, for example associated with air travel and food consumption. 2015 consumption-based emissions increased 5.8% compared to 2008 levels.

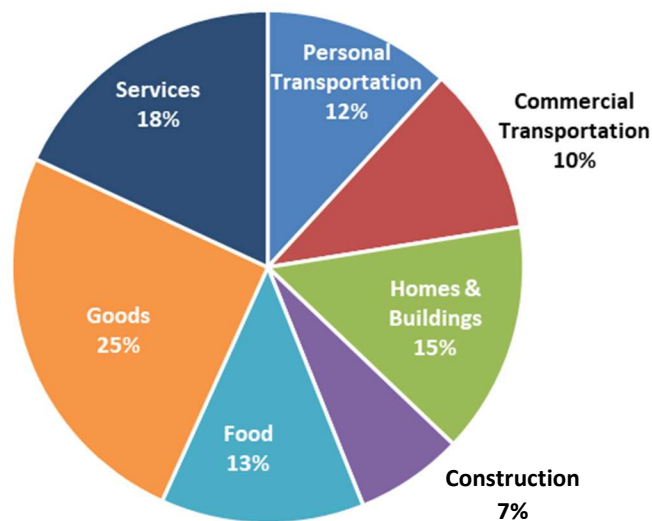


Figure ES-5 offers a broad overview of the distribution of consumption-based emissions among the spending categories that caused them. Some finer points not visible in the figure include:

- Air travel contributed 14% of Personal Transportation emissions, while car travel was responsible for nearly all of the rest. (Only 3.3% of the total is for other modes.)
- 59% of Homes & Buildings emissions are due to HVAC, with the remainder due to the lighting and appliances in the buildings.
- 42% of Construction emissions are due to residential construction.
- Healthcare was the largest Services subcategory, contributing 25% of the emissions. The next two largest subcategories were hotels & entertainment and financial & real estate, contributing 15% and 14% respectively.
- Among Goods, medicines & healthcare supplies was the single largest class of items contributing 6.8% of emissions; clothing, a close second, contributed 6.4%.